

WHAT IS CLAIMED IS:

1 1. A method of communicating information regarding a failure
2 comprising:
3 generating failure information, wherein
4 said failure affects a virtual path,
5 said virtual path is between a first node and a second node,
6 a first zone comprises said first node, and
7 a second zone comprises said second node.

1 2. The method of claim 1, wherein said failure information comprises:
2 a zone identifier.

1 3. The method of claim 2, further comprising:
2 determining said zone identifier by identifying a zone in which said failure has
3 occurred.

1 4. The method of claim 1, wherein said failure information comprises:
2 an action code.

1 5. The method of claim 4, wherein said action code is one of:
2 an idle action,
3 a restored action,
4 a first restore path action, and
5 a second restore path action.

1 6. The method of claim 5, wherein
2 said idle action indicates no action need be performed, and
3 said restored action indicates said virtual path has been successfully restored.

1 7. The method of claim 5, wherein said first restore path action indicates
2 said virtual path should be restored using intra-zone resources.

1 8. The method of claim 5, wherein said second restore path action
2 indicates said virtual path should be restored using inter-zone resources.

1 9. The method of claim 1, further comprising:
2 sending said failure information.

1 10. The method of claim 9, further comprising:
2 communicating said failure information in an in-band channel.

1 11. The method of claim 10, further comprising:
2 inserting said failure information in a frame, wherein
3 said failure information comprises a zone identifier and an action code.

1 12. The method of claim 11, wherein said zone identifier identifies a zone
2 in which said failure has occurred.

1 13. The method of claim 11, wherein said action code is one of:
2 an idle action,
3 a restored action,
4 a first restore path action, and
5 a second restore path action.

1 14. The method of claim 13, wherein said first restore path action indicates
2 said virtual path should be restored using intra-zone resources.

1 15. The method of claim 13, wherein said second restore path action
2 indicates said virtual path should be restored using inter-zone resources.

1 16. The method of claim 11, wherein said frame is a SONET frame and
2 said inserting said failure information comprises:
3 inserting said zone identifier in a K1 byte of said SONET frame, and
4 inserting said action code in a K2 byte of said SONET frame.

1 17. The method of claim 16, wherein said inserting is performed at a third
2 node and said communicating further comprises:
3 communicating said failure information from said third node to a fourth node,
4 wherein said SONET frame includes one of an AIS and an RDI.

1 18. The method of claim 17, wherein said fourth node is a border node.

1 19. The method of claim 17, wherein said border node acts as a proxy node
2 for one of said first and said second nodes, and the method further comprises:
3 initiating restoration of said virtual path, said restoration being initiated by
4 said proxy node.

1 20. A computer system comprising:
2 a processor;
3 computer readable medium coupled to said processor; and
4 computer code, for communicating information regarding a failure and
5 encoded in said computer readable medium, configured to cause said
6 processor to:
7 generate failure information, wherein
8 said failure affects a virtual path,
9 said virtual path is between a first node and a second node,
10 a first zone comprises said first node, and
11 a second zone comprises said second node.

1 21. The computer system of claim D20, wherein said failure information
2 comprises:
3 a zone identifier.

1 22. The computer system of claim 21, wherein said computer code is
2 further configured to cause said processor to:
3 determine said zone identifier by identifying a zone in which said failure has
4 occurred.

1 23. The computer system of claim 20, wherein said failure information
2 comprises:
3 an action code.

1 24. The computer system of claim D23, wherein said action code is one of:
2 an idle action,
3 a restored action,
4 a first restore path action, and
5 a second restore path action.

1 25. The computer system of claim 24, wherein
2 said idle action indicates no action need be performed, and
3 said restored action indicates said virtual path has been successfully restored.

1 26. The computer system of claim 24, wherein said first restore path action
2 indicates said virtual path should be restored using intra-zone resources.

1 27. The computer system of claim 24, wherein said second restore path
2 action indicates said virtual path should be restored using inter-zone resources.

1 28. The computer system of claim 20, wherein said computer code is
2 further configured to cause said processor to:
3 send said failure information.

1 29. The computer system of claim 28, wherein said computer code
2 configured to cause said processor to send said failure information is further
3 configured to cause said processor to:
4 communicate said failure information in an in-band channel.

1 30. The computer system of claim 29, wherein said computer code is
2 further configured to cause said processor to:
3 insert said failure information in a frame, wherein
4 said failure information comprises a zone identifier and an action code.

1 31. The computer system of claim 29, wherein said zone identifier
2 identifies a zone in which said failure has occurred.

1 32. The computer system of claim 30, wherein said action code is one of:
2 an idle action,
3 a restored action,
4 a first restore path action, and
5 a second restore path action.

1 33. The computer system of claim 32, wherein said first restore path action
2 indicates said virtual path should be restored using intra-zone resources.

1 34. The computer system of claim 32, wherein said second restore path
2 action indicates said virtual path should be restored using inter-zone resources.

1 35. The computer system of claim 30, wherein said frame is a SONET
2 frame, and said computer code configured to cause said processor to insert said failure
3 information is further configured to cause said processor to:
4 insert said zone identifier in a K1 byte of said SONET frame, and
5 insert said action code in a K2 byte of said SONET frame.

1 36. The computer system of claim 35, wherein said inserting is performed
2 at a third node, and said computer code configured to cause said processor to
3 communicate is further configured to cause said processor to:
4 communicate said failure information from said third node to a fourth node,
5 wherein said SONET frame includes one of an AIS and an RDI.

1 37. The computer system of claim 36, wherein said fourth node is a border
2 node.

1 38. The computer system of claim 36, wherein said border node acts as a
2 proxy node for one of said first and said second nodes, and said computer code is
3 further configured to cause said processor to:
4 initiate restoration of said virtual path, said restoration being initiated by said
5 proxy node.

1 39. A computer program product encoded in computer readable media,
2 said computer program product comprising:
3 a first set of instructions, executable on a computer system, configured to
4 generate failure information, wherein
5 said failure affects a virtual path,
6 said virtual path is between a first node and a second node,
7 a first zone comprises said first node, and
8 a second zone comprises said second node.

1 40. The computer program product of claim 39, wherein said failure
2 information comprises:
3 a zone identifier.

1 41. The computer program product of claim 40, further comprising:
2 a second set of instructions, executable on said computer system, configured
3 to determine said zone identifier by identifying a zone in which said
4 failure has occurred.

1 42. The computer program product of claim 39, wherein said failure
2 information comprises:
3 an action code.

1 43. The computer program product of claim 42, wherein said action code
2 is one of:
3 an idle action,
4 a restored action,
5 a first restore path action, and
6 a second restore path action.

1 44. The computer program product of claim 43, wherein
2 said idle action indicates no action need be performed, and
3 said restored action indicates said virtual path has been successfully restored.

1 45. The computer program product of claim 43, wherein said first restore
2 path action indicates said virtual path should be restored using intra-zone resources.

1 46. The computer program product of claim 43, wherein said second
2 restore path action indicates said virtual path should be restored using inter-zone
3 resources.

1 47. The computer program product of claim 39, further comprising:
2 a second set of instructions, executable on said computer system, configured
3 to send said failure information.

1 48. The computer program product of claim 47, wherein said second set of
2 instructions further comprises:
3 a first sub-set of said second set of instructions, executable on said computer
4 system, configured to communicate said failure information in an in-
5 band channel.

1 49. The computer program product of claim 48, further comprising:
2 a third set of instructions, executable on said computer system, configured to
3 insert said failure information in a frame, wherein
4 said failure information comprises a zone identifier and an action code.

1 50. The computer program product of claim 49, wherein said zone
2 identifier identifies a zone in which said failure has occurred.

1 51. The computer program product of claim 49, wherein said action code
2 is one of:
3 an idle action,
4 a restored action,
5 a first restore path action, and
6 a second restore path action.

1 52. The computer program product of claim 51, wherein said first restore
2 path action indicates said virtual path should be restored using intra-zone resources.

1 53. The computer program product of claim 51, wherein said second
2 restore path action indicates said virtual path should be restored using inter-zone
3 resources.

1 54. The computer program product of claim 49, wherein said frame is a
2 SONET frame, and said third set of instructions further comprises:
3 a first sub-set of instructions, executable on said computer system, configured
4 to insert said zone identifier in a K1 byte of said SONET frame; and
5 a second sub-set of instructions, executable on said computer system,
6 configured to insert said action code in a K2 byte of said SONET
7 frame.

1 55. The computer program product of claim 54, wherein said third set of
2 instructions is performed at a third node, and said first sub-set of said second set of
3 instructions further comprises:
4 a first sub-sub-set of instructions, executable on said computer system,
5 configured to communicate said failure information from said third
6 node to a fourth node, wherein said SONET frame includes one of an
7 AIS and an RDI.

1 56. The computer program product of claim 55, wherein said fourth node
2 is a border node.

1 57. The computer program product of claim 55, wherein said border node
2 acts as a proxy node for one of said first and said second nodes, and further
3 comprising:
4 a second set of instructions, executable on said computer system, configured
5 to initiate restoration of said virtual path, said restoration being
6 initiated by said proxy node.

1 58. An apparatus for communicating information regarding a failure
2 comprising:
3 means for generating failure information, wherein
4 said failure affects a virtual path,
5 said virtual path is between a first node and a second node,
6 a first zone comprises said first node, and
7 a second zone comprises said second node.

1 59. The apparatus of claim 58, wherein said failure information comprises:
2 a zone identifier.

1 60. The apparatus of claim 59, further comprising:
2 means for determining said zone identifier by identifying a zone in which said
3 failure has occurred.

1 61. The apparatus of claim 58, wherein said failure information comprises:
2 an action code.

1 62. The apparatus of claim 61, wherein said action code is one of:
2 an idle action,
3 a restored action,
4 a first restore path action, and
5 a second restore path action.

1 63. The apparatus of claim 62, wherein
2 said idle action indicates no action need be performed, and
3 said restored action indicates said virtual path has been successfully restored.

1 64. The apparatus of claim 62, wherein said first restore path action
2 indicates said virtual path should be restored using intra-zone resources.

65. The apparatus of claim 62, wherein said second restore path action indicates said virtual path should be restored using inter-zone resources.

66. The apparatus of claim 58, further comprising:
means for sending said failure information.

67. The apparatus of claim 66, further comprising:
means for communicating said failure information in an in-band channel.

68. The apparatus of claim 67, further comprising:
means for inserting said failure information in a frame, wherein
said failure information comprises a zone identifier and an action code.

69. The apparatus of claim 68, wherein said zone identifier identifies a zone in which said failure has occurred.

70. The apparatus of claim 68, wherein said action code is one of:
an idle action,
a restored action,
a first restore path action, and
a second restore path action.

71. The apparatus of claim 70, wherein said first restore path action indicates said virtual path should be restored using intra-zone resources.

72. The apparatus of claim 70, wherein said second restore path action indicates said virtual path should be restored using inter-zone resources.

73. The apparatus of claim 68, wherein said frame is a SONET frame and said means for inserting said failure information comprises:
means for inserting said zone identifier in a K1 byte of said SONET frame,
and
means for inserting said action code in a K2 byte of said SONET frame.

1 74. The apparatus of claim 73, wherein a third node comprises said means
2 for inserting and said means for communicating further comprises:
3 means for communicating said failure information from said third node to a
4 fourth node, wherein said SONET frame includes one of an AIS and an
5 RDI.

1 75. The apparatus of claim 74, wherein said fourth node is a border node.

1 76. The apparatus of claim 74, wherein said border node acts as a proxy
2 node for one of said first and said second nodes, and further comprising:
3 means for initiating restoration of said virtual path, said restoration being
4 initiated by said proxy node.

1 77. A method of communicating information regarding a failure
2 comprising:
3 receiving failure information at a node, wherein
4 said failure affects a virtual path,
5 said virtual path is between a first node and a second node,
6 a first zone comprises said first node, and
7 a second zone comprises said second node.

1 78. The method of claim 77, wherein said failure information comprises:
2 a zone identifier; and
3 an action code.

1 79. The method of claim 78, wherein said action code is one of:
2 an idle action,
3 a restored action,
4 a first restore path action, and
5 a second restore path action.

1 80. The method of claim 79, wherein
2 said idle action indicates no action need be performed, and
3 said restored action indicates said virtual path has been successfully restored.

1 81. The method of claim 79, wherein said first restore path action indicates
2 said virtual path should be restored using intra-zone resources.

1 82. The method of claim 79, wherein said second restore path action
2 indicates said virtual path should be restored using inter-zone resources.

1 83. The method of claim 77, further comprising:
2 determining if said node is a proxy node.

1 84. The method of claim 83, wherein said failure information comprises:
2 an action code.

1 85. The method of claim 84, further comprising:
2 if said node is a proxy node,
3 determining if said proxy node can initiate a restoration process.

1 86. The method of claim 85, further comprising:
2 if said proxy node cannot initiate a restoration process,
3 setting said action code to RESTORE_X.

1 87. The method of claim 86, further comprising:
2 communicating said failure information to another node.

1 88. The method of claim 85, further comprising:
2 if said proxy node can initiate a restoration process,
3 determining if said restoration process has already been initiated by
4 said proxy node.

1 89. The method of claim 88, further comprising:
2 if said restoration process has not already been initiated by said proxy node,
3 causing said proxy node to initiate said restoration process, and
4 setting said action code to IDLE.

1 90. The method of claim 89, further comprising:
2 communicating said failure information to another node.

1 91. The method of claim 88, further comprising:
2 if said restoration process has already been initiated by said proxy node,
3 determining if said restoration process has completed successfully.

1 92. The method of claim 91, further comprising:
2 if said restoration process has completed successfully,
3 setting said action code to RESTORED.

1 93. The method of claim 92, further comprising:
2 communicating said failure information to another node.

1 94. The method of claim 91, further comprising:
2 if said restoration process has not completed successfully,
3 determining if said restoration process is proceeding successfully.

1 95. The method of claim 94, further comprising:
2 if said restoration process is proceeding successfully,
3 setting said action code to IDLE.

1 96. The method of claim 95, further comprising:
2 communicating said failure information to another node.

1 97. The method of claim 94, further comprising:
2 if said restoration process is not proceeding successfully,
3 setting said action code to RESTORE_X.

1 98. The method of claim 97, further comprising:
2 communicating said failure information to another node.

1 99. The method of claim 77, further comprising:
2 determining if said node is a source node, wherein said node being said source
3 node indicates that said node in one of said first and said second nodes.

1 100. The method of claim 99, wherein said failure information comprises:
2 an action code.

1 101. The method of claim 100, further comprising:
2 if said node is a source node,
3 determining if said action code is IDLE.

1 102. The method of claim 101, further comprising:
2 if said action code is IDLE,
3 setting an entry in a virtual path lookup table corresponding to said
4 virtual path to RESTORING.

1 103. The method of claim 101, further comprising:
2 if said action code is IDLE,
3 preventing said node from initiating a restoration process.

1 104. The method of claim 100, further comprising:
2 if said node is a source node,
3 determining if said action code is RESTORED.

1 105. The method of claim 104, further comprising:
2 if said action code is RESTORED,
3 setting an entry in a virtual path lookup table corresponding to said
4 virtual path to RESTORED.

1 106. The method of claim 100, further comprising:
2 if said node is a source node,
3 determining if said action code is RESTORE_I.

1 107. The method of claim 106, further comprising:
2 if said action code is RESTORE_I,
3 initiating an intra-zone restoration process.

1 108. The method of claim 100, further comprising:
2 if said node is a source node,
3 determining if said action code is RESTORE_X.

1 109. The method of claim 108, further comprising:
2 if said action code is RESTORE_X,
3 initiating an end-to-end restoration process.

1 110. The method of claim 109, further comprising:
2 communicating said failure information.

1 111. The method of claim 77, further comprising:
2 communicating said failure information.

1 112. The method of claim 111, wherein said communicating comprises:
2 inserting said failure information into a frame.

1 113. The method of claim 112, wherein said frame is a SONET frame and
2 said inserting said failure information comprises:
3 inserting said zone identifier in a K1 byte of said SONET frame, and
4 inserting said action code in a K2 byte of said SONET frame.

1 114. The method of claim 113, wherein said inserting is performed at a third
2 node and the method further comprises:
3 communicating said failure information from said third node to a fourth node,
4 wherein said SONET frame includes one of an AIS and an RDI.

1 115. A computer system comprising:
2 a processor;
3 computer readable medium coupled to said processor; and
4 computer code, for communicating information regarding a failure and
5 encoded in said computer readable medium, configured to cause said
6 processor to:
7 receive failure information at a node, wherein
8 said failure affects a virtual path,
9 said virtual path is between a first node and a second node,
10 a first zone comprises said first node, and
11 a second zone comprises said second node.

1 116. The computer system of claim 115, wherein said failure information
2 comprises:
3 a zone identifier; and
4 an action code.

1 117. The computer system of claim 116, wherein said action code is one of:
2 an idle action,
3 a restored action,
4 a first restore path action, and
5 a second restore path action.

1 118. The computer system of claim 117, wherein
2 said idle action indicates no action need be performed, and
3 said restored action indicates said virtual path has been successfully restored.

1 119. The computer system of claim 117, wherein said first restore path
2 action indicates said virtual path should be restored using intra-zone resources.

1 120. The computer system of claim 117, wherein said second restore path
2 action indicates said virtual path should be restored using inter-zone resources.

1 121. The computer system of claim 115, wherein said computer code is
2 further configured to cause said processor to:
3 determine if said node is a proxy node.

1 122. The computer system of claim 121, wherein said failure information
2 comprises:
3 an action code.

1 123. The computer system of claim 122, wherein said computer code is
2 further configured to cause said processor to:
3 determine if said proxy node can initiate a restoration process, if said node is a
4 proxy node.

1 124. The computer system of claim 123, wherein said computer code is
2 further configured to cause said processor to:
3 set said action code to RESTORE_X, if said proxy node cannot initiate a
4 restoration process.

1 125. The computer system of claim 124, wherein said computer code is
2 further configured to cause said processor to:
3 communicate said failure information to another node.

1 126. The computer system of claim 123, wherein said computer code is
2 further configured to cause said processor to:
3 determine if said restoration process has already been initiated by said proxy
4 node, if said proxy node can initiate a restoration process.

1 127. The computer system of claim 126, wherein said computer code is
2 further configured to cause said processor to:
3 if said restoration process has not already been initiated by said proxy node,
4 cause said proxy node to initiate said restoration process, and
5 set said action code to IDLE.

1 128. The computer system of claim 127, wherein said computer code is
2 further configured to cause said processor to:
3 communicate said failure information to another node.

1 129. The computer system of claim 126, wherein said computer code is
2 further configured to cause said processor to:
3 if said restoration process has already been initiated by said proxy node,
4 determine if said restoration process has completed successfully.

1 130. The computer system of claim 129, wherein said computer code is
2 further configured to cause said processor to:
3 if said restoration process has completed successfully,
4 set said action code to RESTORED.

1 131. The computer system of claim 130, wherein said computer code is
2 further configured to cause said processor to:
3 communicate said failure information to another node.

1 132. The computer system of claim 129, wherein said computer code is
2 further configured to cause said processor to:
3 if said restoration process has not completed successfully,
4 determine if said restoration process is proceeding successfully.

1 133. The computer system of claim 132, wherein said computer code is
2 further configured to cause said processor to:
3 if said restoration process is proceeding successfully,

4 set said action code to IDLE.

1 134. The computer system of claim 133, wherein said computer code is
2 further configured to cause said processor to:
3 communicate said failure information to another node.

1 135. The computer system of claim 132, wherein said computer code is
2 further configured to cause said processor to:
3 if said restoration process is not proceeding successfully,
4 set said action code to RESTORE_X.

1 136. The computer system of claim 135, wherein said computer code is
2 further configured to cause said processor to:
3 communicate said failure information to another node.

1 137. The computer system of claim 115, wherein said computer code is
2 further configured to cause said processor to:
3 determine if said node is a source node, wherein said node being said source
4 node indicates that said node in one of said first and said second nodes.

1 138. The computer system of claim 137, wherein said failure information
2 comprises:
3 an action code.

1 139. The computer system of claim 138, wherein said computer code is
2 further configured to cause said processor to:
3 if said node is a source node,
4 determine if said action code is IDLE.

1 140. The computer system of claim 139, wherein said computer code is
2 further configured to cause said processor to:
3 if said action code is IDLE,

4 set an entry in a virtual path lookup table corresponding to said virtual
5 path to RESTORING.

1 141. The computer system of claim 139, wherein said computer code is
2 further configured to cause said processor to:
3 if said action code is IDLE,
4 prevent said node from initiating a restoration process.

1 142. The computer system of claim 138, wherein said computer code is
2 further configured to cause said processor to:
3 if said node is a source node,
4 determine if said action code is RESTORED.

1 143. The computer system of claim 142, wherein said computer code is
2 further configured to cause said processor to:
3 if said action code is RESTORED,
4 set an entry in a virtual path lookup table corresponding to said virtual
5 path to RESTORED.

1 144. The computer system of claim 138, wherein said computer code is
2 further configured to cause said processor to:
3 if said node is a source node,
4 determine if said action code is RESTORE_I.

1 145. The computer system of claim 144, wherein said computer code is
2 further configured to cause said processor to:
3 if said action code is RESTORE_I,
4 initiate an intra-zone restoration process.

1 146. The computer system of claim 138, wherein said computer code is
2 further configured to cause said processor to:
3 if said node is a source node,
4 determine if said action code is RESTORE_X.

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1 153. A computer program product encoded in computer readable media,
2 said computer program product comprising:
3 a first set of instructions, executable on a computer system, configured to
4 receive failure information at a node, wherein
5 said failure affects a virtual path,
6 said virtual path is between a first node and a second node,
7 a first zone comprises said first node, and
8 a second zone comprises said second node.

1 154. The computer program product of claim 153, wherein said failure
2 information comprises:
3 a zone identifier; and
4 an action code.

1 155. The computer program product of claim 154, wherein said action code
2 is one of:
3 an idle action,
4 a restored action,
5 a first restore path action, and
6 a second restore path action.

1 156. The computer program product of claim 155, wherein
2 said idle action indicates no action need be performed, and
3 said restored action indicates said virtual path has been successfully restored.

1 157. The computer program product of claim 155, wherein said first restore
2 path action indicates said virtual path should be restored using intra-zone resources.

1 158. The computer program product of claim 155, wherein said second
2 restore path action indicates said virtual path should be restored using inter-zone
3 resources.

1 159. The computer program product of claim 153, further comprising:
2 a second set of instructions, executable on said computer system, configured
3 to determine if said node is a proxy node.

1 160. The computer program product of claim 159, wherein said failure
2 information comprises:
3 an action code.

1 161. The computer program product of claim 160, further comprising:
2 a third set of instructions, executable on said computer system, configured to
3 determine if said proxy node can initiate a restoration process, if said
4 node is a proxy node.

1 162. The computer program product of claim 161, further comprising:
2 a fourth set of instructions, executable on said computer system, configured to
3 set said action code to RESTORE_X, if said proxy node cannot initiate
4 a restoration process.

1 163. The computer program product of claim 161, further comprising:
2 a fifth set of instructions, executable on said computer system, configured to
3 communicate said failure information to another node.

1 164. The computer program product of claim 161, further comprising:
2 a fourth set of instructions, executable on said computer system, configured to
3 determine if said restoration process has already been initiated by said
4 proxy node, if said proxy node can initiate a restoration process.

1 165. The computer program product of claim 164, further comprising:
2 a fifth set of instructions, executable on said computer system, configured to,
3 if said restoration process has not already been initiated by said proxy
4 node,
5 cause said proxy node to initiate said restoration process, and

6 set said action code to IDLE.

1 166. The computer program product of claim 165, further comprising:
2 a sixth set of instructions, executable on said computer system, configured to
3 communicate said failure information to another node.

1 167. The computer program product of claim 164, further comprising:
2 a fifth set of instructions, executable on said computer system, configured to,
3 if said restoration process has already been initiated by said proxy
4 node,
5 determine if said restoration process has completed successfully.

1 168. The computer program product of claim 167, further comprising:
2 a sixth set of instructions, executable on said computer system, configured to,
3 if said restoration process has completed successfully,
4 set said action code to RESTORED.

1 169. The computer program product of claim 168, further comprising:
2 a seventh set of instructions, executable on said computer system, configured
3 to communicate said failure information to another node.

1 170. The computer program product of claim 167, further comprising:
2 a sixth set of instructions, executable on said computer system, configured to,
3 if said restoration process has not completed successfully,
4 determine if said restoration process is proceeding successfully.

1 171. The computer program product of claim 170, further comprising:
2 a seventh set of instructions, executable on said computer system, configured
3 to, if said restoration process is proceeding successfully,
4 set said action code to IDLE.

1 172. The computer program product of claim 171, further comprising:
2 a eighth set of instructions, executable on said computer system, configured to
3 communicate said failure information to another node.

1 173. The computer program product of claim 170, further comprising:
2 a seventh set of instructions, executable on said computer system, configured
3 to, if said restoration process is not proceeding successfully,
4 set said action code to RESTORE_X.

1 174. The computer program product of claim 173, further comprising:
2 a ninth set of instructions, executable on said computer system, configured to
3 communicate said failure information to another node.

1 175. The computer program product of claim 153, further comprising:
2 a second set of instructions, executable on said computer system, configured
3 to determine if said node is a source node, wherein said node being
4 said source node indicates that said node in one of said first and said
5 second nodes.

1 176. The computer program product of claim 175, wherein said failure
2 information comprises:
3 an action code.

1 177. The computer program product of claim 176, further comprising:
2 a third set of instructions, executable on said computer system, configured to,
3 if said node is a source,
4 determine if said action code is IDLE.

1 178. The computer program product of claim 177, further comprising:
2 a fourth set of instructions, executable on said computer system, configured to,
3 if said action code is IDLE,

4 set an entry in a virtual path lookup table corresponding to said virtual
5 path to RESTORING.

1 179. The computer program product of claim 177, further comprising:
2 a fourth set of instructions, executable on said computer system, configured to,
3 if said action code is IDLE,
4 prevent said node from initiating a restoration process.

1 180. The computer program product of claim 176, further comprising:
2 a third set of instructions, executable on said computer system, configured to,
3 if said node is a source node,
4 determine if said action code is RESTORED.

1 181. The computer program product of claim 180, further comprising:
2 a fourth set of instructions, executable on said computer system, configured to,
3 if said action code is RESTORED,
4 set an entry in a virtual path lookup table corresponding to said virtual
5 path to RESTORED.

1 182. The computer program product of claim 176, further comprising:
2 a third set of instructions, executable on said computer system, configured to,
3 if said node is a source node,
4 determine if said action code is RESTORE_I.

1 183. The computer program product of claim 182, further comprising:
2 a fourth set of instructions, executable on said computer system, configured to,
3 if said action code is RESTORE_I,
4 initiate an intra-zone restoration process.

1 184. The computer program product of claim 176, further comprising:
2 a third set of instructions, executable on said computer system, configured to,
3 if said node is a source node,
4 determine if said action code is RESTORE_X.

1 185. The computer program product of claim 184, further comprising:
2 a fourth set of instructions, executable on said computer system, configured to,
3 if said action code is RESTORE_X,
4 initiate an end-to-end restoration process.

1 186. The computer program product of claim 184, further comprising:
2 a fourth set of instructions, executable on said computer system, configured to
3 communicate said failure information.

1 187. The computer program product of claim 153, further comprising:
2 a second set of instructions, executable on said computer system, configured
3 to communicate said failure information.

1 188. The computer program product of claim 153, wherein said second set
2 of instructions comprises:
3 a first sub-set of instructions, executable on said computer system, configured
4 to insert said failure information into a frame.

1 189. The computer program product of claim 188, wherein said frame is a
2 SONET frame, and said first sub-set of instructions comprises:
3 a first sub-sub-set of instructions, executable on said computer system,
4 configured to insert said zone identifier in a K1 byte of said SONET
5 frame; and
6 a second sub-sub-set of instructions, executable on said computer system,
7 configured to insert said action code in a K2 byte of said SONET
8 frame.

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1 190. The computer program product of claim 189, wherein said first sub-set
2 of instructions are executed at a third node, and said computer program further
3 comprises:

4 a third set of instructions, executable on said computer system, configured to
5 communicate said failure information from said third node to a fourth
6 node, wherein said SONET frame includes one of an AIS and an RDI.

1 191. An apparatus for communicating information regarding a failure
2 comprising:

3 means for receiving failure information at a node, wherein
4 said failure affects a virtual path,
5 said virtual path is between a first node and a second node,
6 a first zone comprises said first node, and
7 a second zone comprises said second node.

1 192. The apparatus of claim 191, wherein said failure information
2 comprises:

3 a zone identifier; and
4 an action code.

1 193. The apparatus of claim 192, wherein said action code is one of:
2 an idle action,
3 a restored action,
4 a first restore path action, and
5 a second restore path action.

1 194. The apparatus of claim 193, wherein
2 said idle action indicates no action need be performed, and
3 said restored action indicates said virtual path has been successfully restored.

1 195. The apparatus of claim 193, wherein said first restore path action
2 indicates said virtual path should be restored using intra-zone resources.

1 196. The apparatus of claim 193, wherein said second restore path action
2 indicates said virtual path should be restored using inter-zone resources.

1 197. The apparatus of claim 191, further comprising:
2 means for determining if said node is a proxy node.

1 198. The apparatus of claim 197, wherein said failure information
2 comprises:
3 an action code.

1 199. The apparatus of claim 198, further comprising:
2 means for determining if said proxy node can initiate a restoration process, if
3 said node is a proxy node.

1 200. The apparatus of claim 199, further comprising:
2 setting said action code to RESTORE_X, if said proxy node cannot initiate a
3 restoration process.

1 201. The apparatus of claim 200, further comprising:
2 communicating said failure information to another node.

1 202. The apparatus of claim 199, further comprising:
2 determining if said restoration process has already been initiated by said proxy
3 node, if said proxy node can initiate a restoration process.

1 203. The apparatus of claim 202, further comprising:
2 causing said proxy node to initiate said restoration process, if said restoration
3 process has not already been initiated by said proxy node, and
4 setting said action code to IDLE, also if said restoration process has not
5 already been initiated by said proxy node.

1 204. The apparatus of claim 203, further comprising:
2 communicating said failure information to another node.

- 1 205. The apparatus of claim 202, further comprising:
2 determining if said restoration process has completed successfully, if said
3 restoration process has already been initiated by said proxy node.
- 1 206. The apparatus of claim 205, further comprising:
2 setting said action code to RESTORED, if said restoration process has
3 completed successfully.
- 1 207. The apparatus of claim 206, further comprising:
2 communicating said failure information to another node.
- 1 208. The apparatus of claim 205, further comprising:
2 determining if said restoration process is proceeding successfully, if said
3 restoration process has not completed successfully.
- 1 209. The apparatus of claim 208, further comprising:
2 setting said action code to IDLE, if said restoration process is proceeding
3 successfully.
- 1 210. The apparatus of claim 209, further comprising:
2 communicating said failure information to another node.
- 1 211. The apparatus of claim 208, further comprising:
2 setting said action code to RESTORE_X, if said restoration process is not
3 proceeding successfully.
- 1 212. The apparatus of claim 211, further comprising:
2 communicating said failure information to another node.
- 1 213. The apparatus of claim 191, further comprising:
2 determining if said node is a source node, wherein said node being said source
3 node indicates that said node in one of said first and said second nodes.

1 214. The apparatus of claim 213, wherein said failure information
2 comprises:
3 an action code.

1 215. The apparatus of claim 214, further comprising:
2 determining if said action code is IDLE, if said node is a source node.

1 216. The apparatus of claim 215, further comprising:
2 setting an entry in a virtual path lookup table corresponding to said virtual
3 path to RESTORING, if said action code is IDLE.

1 217. The apparatus of claim 215, further comprising:
2 preventing said node from initiating a restoration process, if said action code is
3 IDLE.

1 218. The apparatus of claim 214, further comprising:
2 determining if said action code is RESTORED, if said node is a source node.

1 219. The apparatus of claim 218, further comprising:
2 setting an entry in a virtual path lookup table corresponding to said virtual
3 path to RESTORED, if said action code is RESTORED.

1 220. The apparatus of claim 214, further comprising:
2 determining if said action code is RESTORE_I, if said node is a source node.

1 221. The apparatus of claim 220, further comprising:
2 initiating an intra-zone restoration process, if said action code is RESTORE_I.

1 222. The apparatus of claim 214, further comprising:
2 determining if said action code is RESTORE_X, if said node is a source node.

1 223. The apparatus of claim 222, further comprising:
2 initiating an end-to-end restoration process, if said action code is
3 RESTORE_X.

1 224. The apparatus of claim 223, further comprising:
2 communicating said failure information.

1 225. The apparatus of claim 191, further comprising:
2 communicating said failure information.

1 226. The apparatus of claim 225, wherein said communicating comprises:
2 inserting said failure information into a frame.

1 227. The apparatus of claim 226, wherein said frame is a SONET frame and
2 said inserting said failure information comprises:
3 inserting said zone identifier in a K1 byte of said SONET frame, and
4 inserting said action code in a K2 byte of said SONET frame.

1 228. The apparatus of claim 227, wherein said inserting is performed at a
2 third node and the method further comprises:
3 communicating said failure information from said third node to a fourth node,
4 wherein said SONET frame includes one of an DIS and an RDI.